

MUN:

a Modern Diagnostic Tool for Improvement of Dairy Nutrition

MUN stands for milk urea nitrogen, which is an important indicator for the efficient utilization of protein for dairy cows. Increasing protein concentration of the diet of lactating dairy cows can often increase milk production. As protein is an expensive ingredient of dairy cattle feeds thus over feeding of protein could be costly to the producer as well as consumers. Two basic ways to monitor the protein status of the dairy animals are by (a) monitoring intake parameters that is crude protein intake of individual animals and (b) monitoring output parameter that is potentially useful is milk urea nitrogen concentrations. Considering the fact, a total of 320 milk samples were collected from four different dairy production regions (Sirajgonj, Rangpur, Jessore and Noakhali) of the country for analyzing the MUN content in milk using a modern device, HPLC (High Performance Liquid Chromatography) machine. The activities were done at BLRI (Bangladesh Livestock Research Institute) under a World Bank and BARC funded sub-project entitled "Study on milk urea nitrogen (MUN) for improvement of dietary nutrition of dairy cows in Bangladesh". Actually our mission is to develop an appropriate feeding guideline for the dairy farmers of the country to support better utilization of feed protein to make the farmers' dairy business more profitable.

Sources of MUN

In the rumen, microbes degrade dietary protein to ammonia. When ammonia is coupled with fermentable carbohydrates, rumen microbes are able to capture the nitrogen and synthesize amino acids and microbial protein. However, excess ammonia in the rumen is absorbed across the rumen wall and taken to the liver to be converted to urea. Blood urea is freely diffusible to milk, and therefore, MUN reflects the urea concentration in blood.

Main factors that affect MUN

- Rations high in crude protein.
- Rations high in rumen degradable protein and soluble protein.
- Rations low in fermentable carbohydrates.

Some other factors are:

- Water intake: increasing water intake and urinary production decreases MUN.
- Level of production: MUN is higher in high producing herds than in low producing herds.
- Method of feeding: separate ingredient feeding increases MUN more than TMR (Total mixed ration) feeding.
- Season: heat stress increases MUN values.

The research works were conducted on farm condition in four regions of the country. The feed samples were collected from the selected dairy farmers in dry and wet season for determining their chemical constituents. Through this work, the actual nutrient intakes by the dairy cows were assessed and their milk production, milk constituents and MUN contents were recorded. A picture from the field is shown when the cow is at their stall and blood sample was collecting from the jugular vein.



Sample collection



Trial at Dairy farm

This research work was carried out at Central Cattle Breeding and Dairy Farm at Savar under Department of Livestock Services (DLS) to determine the optimum feeding levels of rumen degradable protein (RDP) to optimize MUN content. The urine of cows was collected through a special urine collection device from the selected dairy cows for determining urinary nitrogen excretion. The feed samples were recorded and analyzed at BLRI. The main targeted component, MUN was determined routinely during this trial. It was concluded that MUN is positively correlated with intake of CP and RDP (Fig 1& 2). MUN showed a strong correlation with BUN (Fig. 3)

Laboratory analyses of various samples (milk, blood, feed) were done for performing the research activities. The photographs shown are some vital instruments for analyzing the collected milk samples. The feed samples were analyzed at Nutrition laboratory of Animal Production Research Division at BLRI, the milk composition was determined by Lactostar (Gerber, Germany) at Dairy Lab. and the MUN content in milk was analyzed at Chromatographic lab by HPLC under the same division of BLRI



Lactostar - Milk analyzer



Digital balance



BLRI headquarter



MUN analysis by HPLC

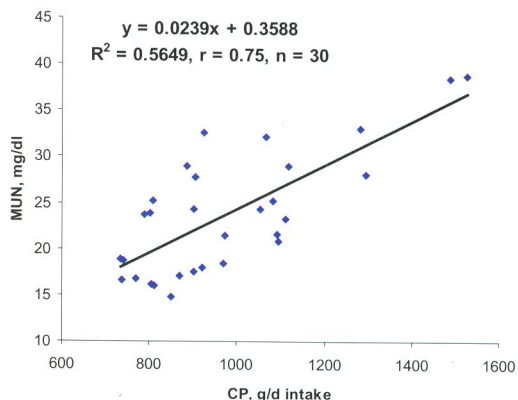


Fig. 1. Relation between CP intake and MUN

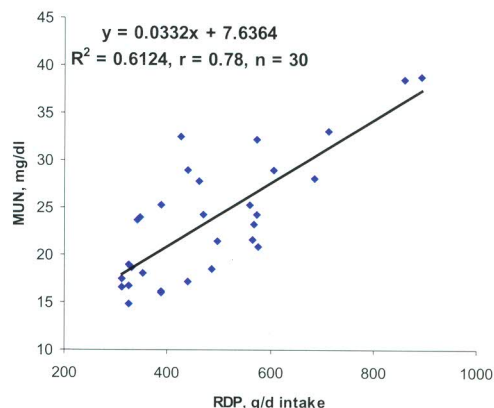


Fig. 2. Relation between RDP intake and MUN

Table 1. Milk urea nitrogen values at on farm & on station

Parameter	Ranges of MUN value (mg/dl)	
On farm		
Genotype	Local cow: 24 - 35 Crossbred cow: 25 -39	
Region		
Sirajgonj	Crossbred: 25 – 39	Local : 24 – 27
Rangpur	Crossbred: 35– 38	Local : 30-32
Jessore	Crossbred: 27 – 29	Local : 25 – 27
Noakhali	Crossbred: 25 - 28	Local : 24 - 26
Seasons	Dry : 25 - 37	Wet : 24 - 37
Lactation stage	< 100 DIM: 22 -31	> DIM 100 : 23 -36
MUN values at On station		
-25% RDP (446 g/d)	Req. RDP (ARC) (574 g/d)	+25% RDP (697 g/d)
16.79 mg/dl	19.20 mg/dl	22.46 mg/dl

RDP = Rumen degradable protein, CP = Crude protein,
DIM = Days in milk, ME =Metabolizable energy

Message for the reader

- The value of MUN in Table 1 seems to be higher compared to European or USA values (12-18 mg/dl) due to genotype, nutrition mainly dietary CP, RDP & ME intake, region, season and some other factors. So, the reference range of MUN values may vary depending on the factors. Our values in Bangladesh are somewhat similar to the findings in Egypt, Ahlam El Shewy (2010) who observed MUN was 25 to 28 mg/dl.
- The values of MUN at on station are lower (tending to the range) due to proper nutritionally balanced feed and other factors those has influenced on MUN content compared to on farm MUN values.

Achievements of the sub project:

- Development of lab protocol and database on milk urea nitrogen. The MUN values fall at on station trial in between 17 to 22 mg/dl which was found higher values at on farm condition between 22 to 39 mg/dl.
- The values of milk composition of local and crossbred cows of different regions and on station will be very helpful for the researcher, policy maker, planner and professionals.
- It is very important to weigh animal regularly for proper farm management especially feed supply and medication. BLRI has developed of a value added industrial technology, digital balance for weighing animal with the help of a company through this project. Many farmers are becoming benefitted by using this balance and it is gaining popularity.

It was observed MUN depends on genotype, stage of lactation and plane of nutrition of cows, more specifically on dietary crude protein and rumen degradable protein.

Further works

- Developing a practical feeding guideline using the filed data those has generated by the ongoing activities of the project.
- MUN has influence on reproduction problems of dairy cows (e.g. to find out repeat breeding problem and its influence on MUN values). Popularise the MUN values to the dairy farmers

Publications (Journal/Mass media/Technical Bulletins etc.)

- Study on different levels of rumen degradable protein and redily degradable carbohydrate from feed on MUN content of cows. Annual Report (2010). Bangladesh Livestock Research Institute (BLRI), Savar, Dhaka 1341.
- MSK Sarker, KS Huque, NR Sarker, MM Hossain, MA Islam and MA Baset (2011). Assessment of some selected dairy farmers in respect of economic status, livestock and feed resources in Bangladesh. Annual Research Review Workshop, 28-29 June, BLRI, Savar.

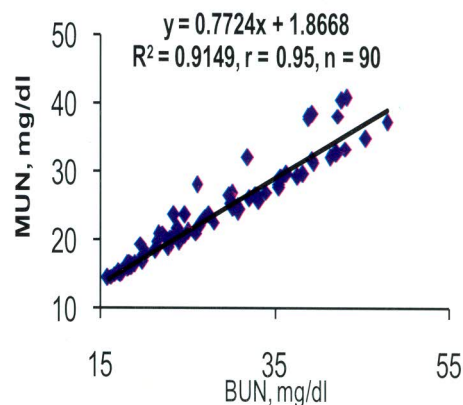
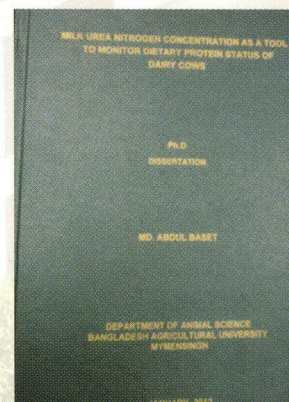
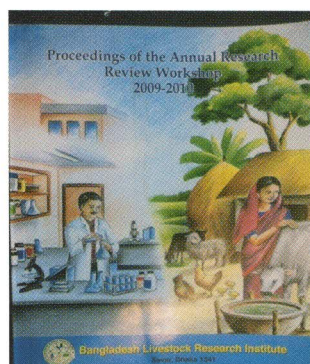


Fig. 3. Relation between MUN and BUN

- c) MSK Sarker, KS Huque, NR Sarker, MM Hossain, MA Islam and AA Bhuiyan (2011). Effect of genotype and lactation on milk urea nitrogen, blood urea nitrogen and milk composition of dairy cows in winter. Annual Research Review Workshop, 28-29 June, BLRI, Savar.
- d) Milk urea nitrogen (MUN) concentration as a tool to monitor dietary protein status of dairy cows. MA Baset, PhD Thesis (2011), Bangladesh Agricultural University, Mymensingh.
- e) MSK Sarker, KS Huque, NR Sarker, MM Hossain, and MM Rahman (2012). Effect of genotype and lactation on milk urea nitrogen, blood urea nitrogen and milk composition of dairy cows. Annual Research Review Workshop, 24-25 June, BLRI, Savar.



Feeding practices followed by farmers in different feed bases and seasons were based on rice straw, small quantities of green grasses from various sources with small supplementation of concentrates. Milk urea nitrogen (MUN) concentration was higher under good base (38.86 mg/dl) than poor feed base condition (28.55 mg/dl). MUN of the local and crossbred cow was found 31.97 and 35.44 mg/dl, respectively. Milk protein was positively correlated with milk yield. MUN increased linearly from 16.79 to 22.46 mg/dl as dietary rumen degradable protein was increased from the lowest (-25%RDP) to the highest (+25%RDP) levels. Urea concentration was 16.97 % higher in +25%RDP and 12.55 % lower in -25%RDP compared to control diet (19.20 mg/dl). The dietary CP and rumen degradable protein had positive impact on milk yield, milk composition and milk urea nitrogen. It was found that feeding dietary rumen degradable protein up to a level of 780 g/d had a significantly positive impact on MUN level, but diets having required level of rumen degradable protein for feeding dairy cows in local condition need to be confirmed through further research.



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Milk urea nitrogen of dairy cows
Milk urea nitrogen concentration as a tool to monitor dietary protein status of dairy cows



A PhD research has been done by Dr. MA Baset through this project, which is recognized and published by the Lambert Publication. In fact, this is a great achievement of this sub-project

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